REMARKS

This paper is in response to the Office Action dated March 2, 2007. Applicants have amended the application as set forth above. Specifically, Claims 48, 64, 66, 67, 69, 72, and 73 have been amended. Claims 68 and 71 have been canceled. Upon the entry of the amendments, Claims 48-59, 64, 66, 67, 69, 70, 72, and 73 are pending in this application. No new matter is added by the amendments as discussed below. Applicants respectfully request the entry of the amendments and reconsideration of the application in view of the above amendments and the following remarks.

Discussion of Amendments

The amendments to Claim 48 are made to further clarify 1) the relative positions of the first and second inlets and the outlet; and 2) the configuration of the flow path. The amendments to Claim 48 are also made to add a substrate holder to the claim, Support for the amendments to Claims 48 can be found in, for example, Figures 1 and 5B and description in paragraphs [0033], [0039], and [0043] of the specification.

In addition, the amendments to Claim 64 are made to further clarify the configuration of the inlet plate. Support for the amendments to Claim 64 can be found in, for example, Figures 6A-6D, description in paragraphs [0071]-[0074] of the specification.

The amendments to Claims 66 and 67 are made to further define the reactive flow geometry. Support for the amendments to Claims 66 and 67 can be found in, for example, Figures 6A-6D, description in paragraphs [0071]-[0074] of the specification.

Claim 69 has been amended to delete "the inlet plate has an elongate axis," which has been incorporated into Claim 64. Claims 72 and 73 have been amended to change their dependencies.

In addition, Claim 73 has been amended to further clarify the configuration of the opening. Support for the amendments to Claim 73 can be found in, for example, Figure 6D, description in paragraph [0073] of the specification.

As such, Applicants respectfully submit that the amendments are fully supported by the application as originally filed and do not constitute the addition of new matter.

In view of the rejection under section 102 over Shang et al. and Park which has now been

withdrawn, the previously presented claims did not have the limitations added by the current amendments. In addition, the previously presented claims do not have the currently added limitations because Applicants did not anticipate the Examiner's interpretation of Okuda et al.'s flow path that focuses on Figure 6B to the exclusion of Figure 6A. Therefore, Applicants respectfully request the entry of the amendments under 37 C.F.R. § 1.116(a)(3).

Discussion of Rejection Under 35 U.S.C. § 102

The Examiner rejected Claims 48-52, 54, 55, 57, and 58 under 35 U.S.C. § 102 (e) as being anticipated by Okuda et al. (U.S. Patent Application Publication No. 2003/0213435). In addition, Claims 48-50 and 53 have been rejected under 35 U.S.C. § 102 (e) as being anticipated by Thakur et al. (U.S. Patent No. 7,175,713). Claims 64, 66, and 68 have been rejected under 35 U.S.C. § 102 (e) as being anticipated by Ahn (U.S. Patent No. 6,852,167).

The Law of Anticipation

Anticipation under Section 102 can be found only if a reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner, 778 F.2d 775 (Fed. Cir. 1985)*. More particularly, a finding of anticipation requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention. *Electro Med. Sys. S.A. v. Cooper Life Sciences, 34 F.3d 1048, 1052 (Fed. Cir. 1994)*. "To anticipate, every element and limitation of the claimed invention must be found in a single prior art reference, arranged as in the claim." *Brown v. 3M, 265 F.3d 1349 (Fed. Cir. 2001)*. "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson, 424 F.2d 1382, 1385 (CCPA 1970)*.

Okuda et al.

Okuda et al. discloses a vertical type semiconductor device producing apparatus. Okuda et al., paragraph [0002]. Okuda et al. discloses a vertical reaction tube 32 constituting a reaction chamber. *Id.* at Figures 6A and 6B (see below); and paragraph [0039]. The reference also discloses first and second gas supply tubes 41, 38. *Id.* at Figures 6A and 6B; and paragraph [0040]. The first gas supply tube 41 is connected (via a first inlet port) to one side of the reaction tube 32. *See id.* The second gas supply tube 38 is also connected (via a second inlet port) to the

one side of the reaction tube 32. *See id.* The reaction tube 32 also includes a nozzle 30 having access holes arranged vertically so as to provide a reactant gas to a large number of substrates W stacked on a boat 39. *See id.* at Figures 6A and 6B; and paragraph [0041]. The reaction tube 32 also includes an exhaust tube 40 connected (via an exhaust port) to a lower portion of the tube 32. *See id.* at Figures 6A and 6B; and paragraph [0040].

FIG. 6A

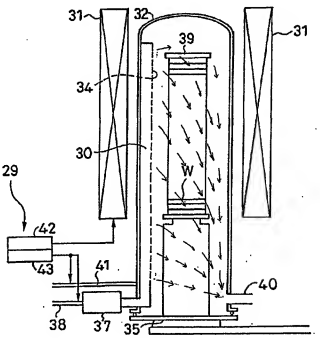
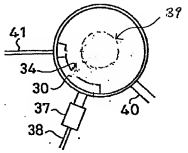


FIG. 6B



Applicants submit that Okuda et al. fails to anticipate Claims 48-52, 54, 55, 57, and 58 as amended. The reference does not show each and every limitation of the claims, and thus the claims cannot be anticipated by the reference.

First, Okuda et al. fails to disclose that "the second inlet is positioned to open into the laminar flow path *between the first inlet and the substrate holder*," as recited in Claim 48 as amended. In Okuda et al.'s reaction tube 32, both inlets are positioned on a side of the reaction tube, while being laterally spaced from each other. Okuda et al. does not disclose that one of the inlets is positioned between the other inlet and the boat 39 (indicated by a dotted circle in Figure 6B above). As the inlets are equidistant from the substrates, under no reasonable interpretation, can one inlet be open into a flow path between the other inlet and a substrate.

In addition, Okuda et al. fails to disclose that "the first inlet, the outlet, and the process chamber define a *laminar* flow path between the first inlet and the outlet," as recited in Claim 48 as amended. The configuration of the reaction tube 32 of Okuda et al. cannot define a laminar flow path. Okuda et al.'s reaction tube 32 is of a vertical type, and has a vertically extending reaction chamber. The access holes 34 of the nozzle 30 on one side of the tube 32 are vertically arranged so as to open to substantially all of the substrates W stacked on the boat 39. On the other hand, only a single exhaust port is positioned at the bottom of another side of the tube 32. Because of the relative positions and numbers of the access holes 34 and the exhaust port, a non-laminar gas flow pattern would be formed, as indicated by arrows in Figure 6A above provided in Okuda et al. itself, if both the access holes 34 and the exhaust port are open.

As such, Okuda et al. fails to disclose each and every limitation of Claim 48, and thus fails to anticipate Claim 48. Claims 49-52, 54, 55, 57, and 58 depend directly or indirectly from Claim 48, and thus are not anticipated by the reference for substantially the same reasons.

Thakur et al.

Thakur et al. discloses an apparatus for performing cyclical deposition processes in semiconductor substrate processing systems. Thakur, column 1, lines 13-17. Thakur et al. discloses a process chamber 101 having a substrate support 111 and a showerhead 130 positioned over the substrate support 111. *Id.* at Figures 2-5; column 2, lines 56-60; column 3, lines 20-26; and column 5, lines 15-18. The showerhead 130 includes centrally located slotted openings

131A, 131B, and a plurality of apertures 133 surrounding the openings 131A, 131B. *Id.* at Figures 2-5; and column 5, lines 19-33.

Applicants submit that Thakur et al. fails to anticipate Claims 48-50, and 53 as amended. The reference does not show each and every limitation of the claims, and thus the claims cannot be anticipated by the reference.

Thakur et al. fails to disclose that "the second inlet is positioned to open into the laminar flow path *between the first inlet and the substrate holder*," as recited in Claim 48 as amended. All the inlets of Thakur et al. are positioned on the showerhead 130 over the substrate support 111, while being laterally spaced apart from one another and vertically spaced equally from the substrate support 111. Thus, Thakur et al. fails to disclose an inlet positioned between another inlet and a substrate holder.

As such, Thakur et al. fails to disclose each and every limitation of Claim 48, and thus fails to anticipate Claim 48. Claims 49, 50, and 53 depend directly from Claim 48, and thus are not anticipated by the reference for substantially the same reasons.

Ahn

Ahn discloses a CVD system 100 which includes a chamber 110, a wafer holder 120, and a gas distribution fixture 130. Ahn, Figure 1; and column 2, lines 45-50. The gas distribution fixture 130 includes a gas-distribution member 132 which includes gas-distribution holes or orifices 132.1 and gas-distribution channels 132.2. *Id.* at Figure 2; and column 3, lines 11-31. Ahn discloses that the gas-distribution holes 132.1 are substantially circular with a common diameter in the range of 15-20 microns. *Id.*

Applicants submit that Ahn fails to anticipate Claims 64 and 66 as amended. The reference does not show each and every limitation of the claims, and thus the claims cannot be anticipated by the reference. Claim 68 has been canceled, rendering the rejection to this claim moot.

Ahn fails to disclose that "the inlet plate comprises a plate of a substantially oval shape having an elongate axis, and the plate comprises a flow blocking section and an opening, *the opening having an elongate shape extending along the elongate axis*," as recited in Claim 64 as amended. Ahn only discloses a gas-distribution member 132 having substantially circular

distribution holes 132.1. Ahn does not disclose an opening having an elongate shape extending along an axis of an oval-shaped plate.

In addition, Ahn fails to disclose that "the flow blocking section and the opening are together configured to alter a path of the reactive flow such that the reactive flow *substantially widens and flattens*," as recited in Claim 64 as amended. Ahn discloses the shape of the gas-distribution holes 132.1, but does not teach that the holes 132.1 are structured to widen and flatten the gas flow therethrough.

As such, Ahn fails to disclose each and every limitation of Claim 64, and thus fails to anticipate Claim 64. Claim 66 depends directly from Claim 48, and thus is not anticipated by the reference for substantially the same reasons.

As explained above, none of the references anticipate Claims 48 and 64. Claims depending directly or indirectly from Claims 48 or 64 are not anticipated by the references for substantially the same reasons. For all of these reasons, Applicants respectfully request withdrawal of this rejection.

Discussion of Rejection Under 35 U.S.C. § 103

The Examiner rejected Claims 53, 56, and 59 under 35 U.S.C. § 103 (a) as being unpatentable over Okuda et al. Claims 67 and 69-73 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over Ahn.

Standard for Obviousness Rejection

The Patent and Trademark Office has the burden under section 103 to establish a *prima facie* case of obviousness. *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-87 (Fed. Cir. 1984). To establish a *prima facie* case of obviousness, the following criteria must be met: there must be a reasonable expectation of success; and the prior art reference (or references when combined) must teach or suggest all the claim limitations. *See* M.P.E.P. § 2143.

Okuda et al.

Applicants submit that Claims 53, 56, and 59 are patentable over Okuda et al. at least

because they depend directly or indirectly from Claim 48 as amended which is patentable over the reference, and also recite further distinguishing combinations. With respect to Claim 48 as amended, the Office Action fails to establish a *prima facie* case of obviousness.

Okuda et al. fails to teach or suggest all the claim limitations. As discussed above, Okuda et al. fails to disclose that "the second inlet is positioned to open into the laminar flow path *between the first inlet and the substrate holder*," as recited in Claim 48 as amended. In addition, Okuda et al. fails to disclose that "the first inlet, the outlet, and the process chamber define a laminar flow path between the first inlet and the outlet," as recited in Claim 48 as amended. The reference, therefore, does not teach or suggest all the claim limitations of Claim 48. The secondary references fail to supply the deficiencies of Okuda et al.

As such, Applicants submit that Claim 48 is patentable over Okuda et al. The rejected Claims 53, 56, and 59 depend directly or indirectly from Claim 48, and are allowable for substantially the same reasons.

Ahn

Applicants submit that Claims 67, 69, 70, 72, and 73 are patentable over Ahn at least because they depend directly or indirectly from Claim 64 as amended which is patentable over the reference, and also recite further distinguishing combinations. Claim 71 has been canceled, rendering the rejection to this claim moot. With respect to Claim 64 as amended, the Office Action fails to establish a *prima facie* case of obviousness.

First, Ahn fails to teach or suggest all the claim limitations of Claim 64. As discussed above, Ahn fails to disclose that "the inlet plate comprises a plate of a substantially oval shape having an elongate axis, and the plate comprises a flow blocking section and an opening, *the opening having an elongate shape extending along the elongate axis*," as recited in Claim 64 as amended. In addition, Ahn fails to disclose that "the flow blocking section and the opening are together configured to alter a path of the reactive flow such that the reactive flow *substantially widens and flattens*," as recited in Claim 64 as amended.

Second, the art of record establishes no reason to modify Ahn to provide an inlet plate having an *elongate opening* which, in combination with a flow-blocking section, is configured to substantially *widen and flatten* a reactive flow, as recited in Claim 64 as amended. As discussed

above, Ahn discloses a gas-distribution member 132 having gas-distribution holes 132.2 that are substantially circular. Ahn, Figures 1 and 2; and column 3, lines 11-31. Ahn also states that other shapes and sizes of holes can be used. *Id.* at column 3, lines 26-27.

However, a skilled artisan would not modify the gas-distribution holes 132.2 to have an elongate shape so as to *widen and flatten* a reactive flow, given an explicitly stated objective of Ahn. One of Ahn's objectives is to provide a deposition (e.g., CVD) system for forming a CVD layer having a uniform thickness. *See* Ahn, column 1, lines 39-49. Ahn discloses a showerhead including a configuration of holes that permits *uniform gas flow* to achieve the objective. *See id.* at column 2, lines 14-20. A skilled artisan would be motivated to modify the shape of the gas-distribution holes such that the holes can provide a uniform gas flow for a given process chamber design. However, there is no teaching or suggestion that an elongate opening configured to *substantially widen and flatten* a gas flow would be suitable for providing a *uniform* gas flow in such a showerhead configuration. Therefore, in view of the objective of Ahn, a skilled artisan would not modify the reference to provide the elongate opening of Claim 64.

As such, the Office Action fails to establish a *prima facie* case of obviousness with respect to Claim 64 as amended. Therefore, Applicants respectfully submit that Claim 64 is patentable over Ahn, and thus Claims 67, 69, 70, 72, and 73 depending from Claim 64 are patentable over the references for the substantially the same reasons.

As explained above, Claims 53, 56, 59, 67, 69, 70, 72, and 73 are patentable over the references under 35 U.S.C. § 103(a). For all of these reasons, Applicants respectfully request withdrawal of this rejection.

CONCLUSION

In view of Applicants' amendments to the claims and the foregoing remarks, Applicants respectfully submit that the present application is in condition for allowance. Should the Examiner have any remaining concerns, which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: May 1, 2007

By: _____

Adeel S. Akhtar
Registration No. 41,394
Attorney of Record
Customer No. 20,995
(415) 954-4114

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041007